

High Friction Surface Treatment

The Kentucky Experience

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2011 Kentucky Statistics

- **Population**
 - 4.38 Million
- **Area**
 - 39,486 Mi²
- **Public Agencies**
 - 120 Counties
 - 426 Cities/Incorporated Areas
- **Total Mileage**
 - 79,255
- **State Mileage**
 - 27,605 Total
 - 25,194 Rural



2011 Kentucky Crash Statistics

- **670 Fatal Crashes**
 - 721 Fatalities
 - 258 in Curves (38.5%)
- **24,196 Injury Crashes**
 - 36,345 ABC Injuries
- **Total Economic Cost**
 - \$2.1 Billion



“Predictions are difficult, especially about the future.” – Yogi Berra, Baseball Player



RD Focus State

- **Roadway Departures**
 - >60% of all highway fatalities
- **Implementation Plan**
 - Enhanced Signs & Markings
 - Rumble Strips
 - Select Tree Removal
 - Corridor Enforcement
 - Median Barrier
 - High Friction Surfaces
 - Traffic Calming



“Design” Features

The relationship between side-force friction for horizontal curves (the most critical horizontal alignment), vehicle speed, radius of curvature, and highway cross-section (super-elevation) is defined using the following AASHTO Green Book equation (AASHTO, 2001):

$$F_s = \frac{V^2}{15 \times R} - e \quad \text{Eq. 23}$$

where: F_s = Side-force friction demand.
 e = Super-elevation rate, ft/ft.
 V = Speed, mi/hr.
 R = Radius, ft.



High Friction Surface (HFS)

- Pavement surfacing systems with exceptional skid-resistant properties that are not typically acquired by conventional materials
- **Aggregate**
 - Generally calcined bauxite
- **Binder**
 - Bitumen-extended epoxy resins
 - Epoxy-resin
 - Rosin-ester
 - Polyurethane-resin
 - Acrylic-resin



Site Selection

- **Preliminary Screening**
 - Top 30 Curves/ Top 30 Ramps
- **Roadway Departure Implementation Plan**
 - State Rural Roads
 - Wet – Ratio of 0.35
 - Threshold crash level of 8 in 5 years (2004-2008)
- **Highway Safety Manual**
 - Expected Crash Methodology



Example Locations

D7 Fayette County KY 922, Proposed Friction Treatment Map



Contracting

- **Preliminary Contract**
 - 2 Separate Contracts for 2 Individual Sites
 - Traditional Design-Bid-Build
 - Manual Installation
- **Systematic Contract**
 - Master Agreement – “On Call Contract”
 - Manual and Mechanical Installation
 - 79 Sites Installed
 - 17 Sites Remain
 - Sites May Contain Multiple Curves
- **Future Contract**
 - Traditional Design-Bid-Build
 - Regional Contracts – Multiple Sites Per Contract



Surface Preparation

- **Concrete Bridge Deck and Pavement**

- Shot Blast CSP 5 to CSP 7
- Vacuum Surface Debris



- **Asphalt Pavement**

- Air Blast 180CFM



HFS Installation

- **Manually**

- Manual mixing of binder
- Manual application of binder with squeegee
- Manual broadcasting and distribution of aggregate
- Production: 200-300 SY/hr.



HFS Installation

- **Mechanically**

- Machine mixing and application of binder
- Machine application of aggregate
- Production: 1500-2000 SY/hr.



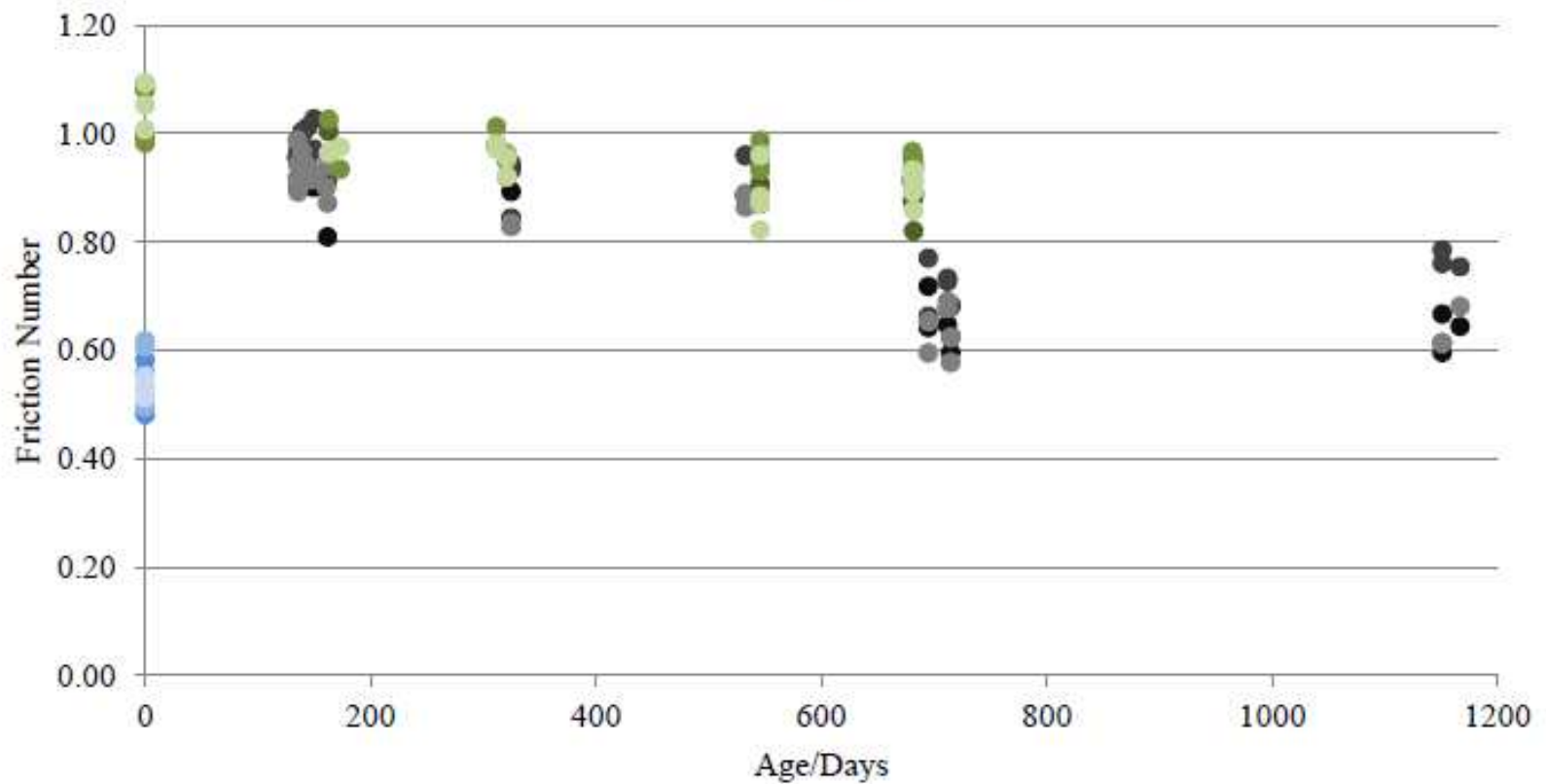
Friction Testing

- Dynamic Friction Tester (DFT)*
- Griptester
- Locked Wheel Skid Trailer



Highway Safety Improvement Program
Data Driven Decisions

All Sites Plotted by Age and Friction Number
60 km/hr



- Dark RWP
- Dark CWP
- Dark LWP
- Light RWP
- Light CWP
- Light LWP
- AC RWP
- AC CWP
- AC LWP



Highway Safety Improvement Program
Data Driven Decisions

Fayette County – KY 922



Fayette County – KY 922

3 Years Prior			
Wet	Ave	Dry	Ave
8	2.7	5	1.7

2.4 Years After			
Wet	Ave	Dry	Ave
1	0.4	0	0



Oldham County – KY 22



Highway Safety Improvement Program
Data Driven Decisions

Oldham County – KY 22

3 Years Prior			
Wet	Ave	Dry	Ave
53	17.7	3	1

3+ Years After			
Wet	Ave	Dry	Ave
5	1.4	0	0

91% Reduction



Fayette County – I 75 Exit 113



Fayette County – I 75 Exit 113



Fayette County – I 75 Exit 113

3 Years Prior			
Wet	Ave	Dry	Ave
18	6	10	3.3

2.4 Years After			
Wet	Ave	Dry	Ave
0	0	1	0.4









NTPEP Test Deck

- <http://www.ntpep.org/Pages/PCODocuments.aspx>
- **Polymer Concrete Overlay**
 - Concrete Pavement
 - Asphalt Pavement
 - Concrete Bridge Deck
- **Provide Qualified Product List**



Questions, Concerns, Pontifications...

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